

Air Quality on the Colorado Plateau: Panel Discussion Synopsis

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Abstract. Five air quality experts participated in a panel discussion about the future of air quality on the Colorado Plateau. The synopsis of their comments is preceded by a historical interpretation of legislative and regulatory actions that have been applied to protecting visibility in national parks and wilderness areas, with particular emphasis on actions to control emissions at the Navajo Generating Station near Grand Canyon National Park. The synopsis presents priorities for visibility and ecological research, implementing provisions of the Clean Air Act, funding, public education, and cooperation. The panelists also identified political and legal challenges to progress in protecting air quality on the Colorado Plateau, but were unanimous in their optimism about prospects for the future.

Key words: Air quality, Clean Air Act, national parks, regulations, visibility, wilderness.

There are no concrete notions founded in experience upon which a conception of these color effects and optical delusions can be constructed and made intelligible.

—Clarence Dutton
1882

Visions of the Colorado Plateau elude scientific and artistic description. Today, our most objective indicators of what we see are hotly contested. Is haze in the Grand Canyon the same as was naturally evident more than a century ago when Dutton first described what he saw? Or is our view being obscured by air pollutants resulting from insatiable demands for convenient transportation and comfortable places to live, to work, and to play? Despite innumerable analyses, contemporary conclusions were foretold by Dutton: "Things are not what they seem, and the perceptions cannot tell us what they are."

The Grand Canyon Trust's¹ purpose for convening a panel discussion about air quality on the Colorado Plateau was not to recount technical debates about causes of haze in the Grand Canyon. Rather, it was to solicit educated opinions about the future. Our panelists were asked to identify their highest priority objectives for protecting air quality and related values on the Colorado Plateau. Their answers included a full range of research, economic, ecological, legal, and political priorities. Further, the discussion that followed was an informative but meandering dialogue that would frustrate even the most interested reader of a verbatim transcript.

Therefore, the purpose of this commentary is to capture some of what was said and to extend those thoughts into useful guidelines for the future. None of what is presented here is attributable to any one panelist; rather, this paper synthesizes the many ideas that were presented. For the record, each panelist has reviewed the commentary and has made suggestions that have been incorporated into the following discussion.

Historical Context

Over the past few decades, air quality has been legally defined as a value worth protecting. In passing the first Air Quality Act in 1966, the U.S. Congress initiated a process that continues to be refined, applied, and amended. A primary goal of the various clean air acts and amendments that followed the 1966 act has been to protect public health from airborne pollutants.

The need to protect visibility and other air quality related values was not mentioned in the original legislation, but the 1970 Clean Air Act Amendments required the Environmental Protection Agency (EPA) to establish standards to safeguard public welfare, including property, crops, public trans-

¹The Grand Canyon Trust is a regional organization based in Flagstaff, Arizona, that is dedicated to conserving the natural and cultural resources of the Colorado Plateau.

portation, and aesthetics. The amendments also expressed the intent that the quality of the air be maintained or enhanced. This intent was subsequently interpreted to mean that new sources may not be permitted to have a significant effect on U.S. air quality, leading to the doctrine known as Prevention of Significant Deterioration.

In 1972, the U.S. Bureau of Reclamation issued its final Environmental Impact Statement (EIS) for the coal-fired Navajo Generating Station (NGS) near Page, Arizona. The proximity of NGS to Grand Canyon, Bryce Canyon, Capitol Reef, and Canyonlands national parks prompted reactions about the possible effect of its emissions on visibility. Written comments were submitted by the Secretary of the Interior, the National Park Service, the EPA, several state environmental agencies, and concerned citizens.

The EIS noted that all of the co-owners of NGS, including the Bureau of Reclamation (which owns the largest share) agreed to do everything possible to minimize visibility-impairing emissions from the NGS smokestacks. Specifically, the participants committed themselves to "installing sulfur dioxide removal systems on all three units of the Navajo Generating Station . . . [and that] . . . a removal system will be installed and operative before . . . May 1975." However, subsequent negotiations between NGS owners and EPA delayed a decision to control sulfur dioxide emissions.

Efforts were soon organized to amend the 1970 Clean Air Act with specific provisions for protecting visibility in parks and wilderness areas. Gordon Anderson, who was then employed at Bryce Canyon National Park, began photographing examples of declining visibility at Yovimpa Point and other prominent vistas on the Colorado Plateau. Anderson's photos became an important part of the evidence that convinced Congress to approve the 1977 Clean Air Act Amendments.

Under Section 169A of the 1977 Amendments, "best available retrofit technology" (BART) is required on any major stationary source built after 1962 if that source "emits any air pollutant which may reasonably be anticipated to cause or contribute to any impairment of visibility" in a listed class I area. This provision was made with the specific intention of requiring scrubbers on the NGS. Representative Henry Waxman introduced the Committee Report for the 1977 Clean Air Act Amendments with the following statement:

Protecting the Grand Canyon simply must become a normal business practice of the American industry . . . [T]he Four Corners and Navajo power plants can expect to retrofit with additional pollution controls to limit the vast deterioration in visibility which their plumes have caused.

Impairment of visibility is the single most apparent effect air pollution has on the environment. It is our intent that aggressive steps be taken to reduce this eyesore that has defaced our grand vistas in the West.

Despite congressional intent, the EPA failed to implement provisions to protect visibility in designated class I areas. A citizens' lawsuit was filed in 1982 to pressure EPA into enforcing the law. The agency countered that

before it could attribute visibility impairment to a specific source, sufficient evidence had to be collected to counter industry claims that sources such as NGS were not responsible for impairing visibility in protected parks of the Colorado Plateau.

The burden of proof fell on the shoulders of the National Park Service and other federal land management agencies that were experiencing severe budget cutbacks during the Reagan administration. Consequently, it took until September 1989 before the EPA was able to publish a notice of proposed rulemaking for the NGS. The operators of NGS challenged EPA's regulatory action, and the courts extended the deadline. By October 1991, we expect the EPA to issue its final rule on the requirement of sulfur-controlling scrubbers at the NGS.

It would be naive to conclude that national parks on the Colorado Plateau will now be protected from visibility-impairing pollutants and airborne threats to their ecological integrity.

Regional haze and ozone from growing urban centers has yet to be controlled. Uncontrolled oxides of nitrogen and sulfur and hazardous trace elements are still emitted from nearby power plants and smelters. Research budgets remain tight, and our knowledge about the ecological effects of airborne pollutants is dangerously small when compared to their potentially long-term ecological consequences.

Priorities

We can safely conclude that the issues involved in improving air quality are sufficiently complex to require much more research. But once complex air quality problems are better defined and understood, the equally complex issues surrounding how they are resolved still remain. Our panelists were asked to identify their priorities to improve air quality on the Colorado Plateau.

Visibility Research

Visibility research is a high priority for most of our panelists. This is possibly due to an acknowledged sense that the policy of preventing significant deterioration in air quality remains an elusive goal across the nation in general and particularly in areas where the air is already cleaner than established standards. Although protecting visibility in class I areas is legally mandated, institutional priorities and budgets have not supported reasonable progress toward this end.

Past research has focused on various techniques for monitoring visibility, attributing impairment to specific sources, and developing models for predicting the transport of pollutants between the source and receptors. Much has been learned in the recent decade despite the fact that the EPA's budget for visibility research fell from \$2.5 million in 1980 to less than \$300,000 per year between 1981 and 1985. Yet if it remains necessary, from a regulatory

standpoint, much more needs to be learned about the influence of topography, meteorology, and air chemistry on the formation and movement of visibility-impairing emissions throughout large regions of the western United States.

Another important dimension of visibility research is the effect of air pollutants on visitors to class I areas. The EPA's 1980 visibility regulations defined "visibility impairment" as "any humanly perceptible change in visibility (visual range, contrast, coloration) from that which would have existed under natural conditions." Unless "significant impairment" of visitors' experience can be demonstrated, owners of power plants and other potential sources of visibility impairment can apply for exemption from an EPA ruling that requires best available retrofit technology. The federal land management agency responsible for the protected area, however, must concur with any exemption.

Studies of visitors' perception of visibility impairment have been conducted at the Grand Canyon and elsewhere on the Colorado Plateau. But there remains a need for additional research to document the extent to which people notice and are adversely affected by anthropogenic sources of haze in class I areas. Such research may also be useful in establishing standards for maintaining and enhancing visibility.

Ascertaining the benefits from improving visibility is a related line of research that is becoming increasingly necessary as legal and policy disputes accelerate in regard to implementing Section 169A of the Clean Air Act. Much of the existing research has concentrated on people's willingness to pay for clean, clear air in national parks and other class I areas. Some have suggested that the economic benefits of clean air could be better measured by asking visitors how much compensation would be necessary for them to accept visibility pollution over national parks. There remains considerable debate over which type of measurement is more appropriate in estimating benefits.

Nonetheless, researchers are able to estimate the economic cost of visibility impairment or, conversely, the benefits of improved visibility. Although the EPA is not required to justify a BART ruling on the basis of a cost-benefit analysis, it must take into account estimated benefits derived from various alternatives. In the NGS proposed rule, the EPA did cite lower costs relative to benefits as an indicator of the reasonableness of their ruling. It is likely that there will be growing demand for benefits research to justify such decisions and their relation to estimated degrees of improvement in visibility.

Ecological Research

While visibility in most national parks is specifically protected by law, it is an ephemeral issue. A small shift in weather can remove any sign of haze; however, pollutants fall from the air and blanket the landscape. Unfortunately, assessing long-term, cumulative ecological effects from air pollutants has been a low priority. Clearly, there is a legal mandate to maintain ecological integrity within parks. But never has such a pervasive external threat been encountered with so little means to measure ecological effects and so few tools to do anything about it.

Our panelists agreed that a higher priority must be placed on evaluating cumulative ecological effects from ozone, volatile organic compounds, sulfur and nitrogen oxides, hazardous trace elements, and acid rain. There is a need to expand monitoring of rock pools, lichens, and cryptogamic crusts. Developing long-term assessments of ecological communities is also needed. Little baseline information is available for the Colorado Plateau regarding air quality as related to soils, nutrient mobilization, leaching, toxic effects on roots, foliar conditions, invertebrate and vertebrate populations, and the bioaccumulation of trace elements.

Funding

Funding for air quality-related research is directly related to research deficiencies. The 1990 Clean Air Act authorized \$40 million for continuing visibility research over the next 5 years, although appropriation of those funds is not assured. The act also authorizes an unspecified amount of funds for "air pollutant monitoring, analysis, modeling, and inventory research" and "ecosystem research." Therefore, the new Clean Air Act is responsive to some of the more critical needs for visibility and air pollutant or ecosystem research; however, this commitment must find its way through the federal budget and appropriation process.

The 1990 Clean Air Act offers a few rays of hope. It authorizes \$8 million/year for the next 5 years to "conduct research to identify and evaluate sources and source regions of both visibility impairment and regions that provide predominantly clean air in class I areas." It establishes the Grand Canyon Visibility Transport Commission to assess adverse effects on visibility in the region and, within 4 years, recommend measures to remedy such adverse effects under the Clean Air Act. It requests that a report to congress be prepared by the National Academy of Sciences "on the role of secondary ambient air quality standards in protecting welfare and the environment." It directs the EPA in cooperation with other federal agencies to "conduct a research program to improve understanding of the short-term and long-term causes, effects, and trends of ecosystems damage from air pollutants on ecosystems."

These congressionally enacted programs may or may not achieve their intended objectives. They may also place a higher priority on continued study than on taking specific actions to enforce Section 169a of the Clean Air Act or to develop programs for controlling regional sources of air pollution. Our panelists were asked to comment on these and other issues about our future.

Implementing Clean Air Act Provisions

Although there is a general agreement about the need for more air quality research, our panelists expressed differing opinions about how much more needs to be known before provisions of the Clean Air Act can be fully implemented. One approach would be to take a middle-of-the-road path of

reasonableness, wherein decisions must be justified on the basis of accurate assessments of the costs of emissions controls versus realistic calculations of environmental benefits. Such relative cost-effectiveness might be expressed in terms of dollars per unit of visibility enhancement or per unit of ecological protection.

Another approach would be to use every regulatory and political means available to control all new sources of air pollution and to significantly reduce emissions from existing sources. Based on evidence that air pollution is already significantly impairing the structure and function of ecosystems, immediate actions are essential to minimize long-term cumulative effects. This approach asserts that it is reasonable to require proponents to demonstrate that their proposed actions will not cause ecological damage before being allowed to proceed.

Once the 1977 Clean Air Amendments were enacted, the EPA initiated Phase I rules for controlling major stationary sources that may reasonably be anticipated to cause visibility impairment in class I areas. The EPA postponed promulgating Phase II rules for controlling mobile and regional sources of haze commonly associated with major population centers. One panelist admonished the EPA for failing to follow through with Phase II rules. He believes that controlling regional sources of haze as required by law should be a top EPA priority.

Phase I regulations also need more attention. Some panelists noted that the pending decision regarding NGS should be expedited and that the EPA needs to accelerate its review of other stationary sources. It was suggested that a concerted effort to implement visibility regulations may indirectly reduce some of the ecological effects of fine particulate deposition.

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Funding for air quality-related research is directly connected to federal and state abilities to implement many provisions of the Clean Air Act. The 1990 Clean Air Act offers a few rays of hope. It authorizes \$8 million/year for the next 5 years to "conduct research to identify and evaluate sources and source regions of both visibility impairment and regions that provide predominately clean air in class I areas." It directs the EPA, in cooperation with other federal agencies, to "conduct a research program to improve understanding of the short-term and long-term causes, effects, and trends of ecosystems damage from air pollutants on ecosystems." The act also authorizes

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Education

There is a need to expand public awareness about air quality-related values on the Colorado Plateau. Grand Canyon, Bryce Canyon, and other national parks have prepared public displays and have briefed their interpretive staff on visibility issues. Without a more comprehensive effort to educate the public, however, the drive to improve air quality is likely to remain a low political, regulatory, and budgetary priority.

One of our panelists suggested seeking better ways to illustrate air quality-related values with simple but accurate examples. A comment from the audience expressed the problem this way: unless we are able to show the public why they should care about air quality, federal land managers will fail to sustain the support necessary for improvement.

Cooperation

Conflict has characterized the early phases of protecting air quality on the Colorado Plateau. While disagreements will persist, our panelists agreed that more cooperation is needed in several key areas.

First, it is important for researchers to expand their exchange of information and participation in joint efforts such as the Subregional Cooperative Electric Utility, the National Park Service, and the Environmental Protection Agency Study (SCENES) and Interagency Monitoring of Protected Visual Environments (IMPROVE). As the U.S. Forest Service develops its visibility monitoring and assessment program, it could benefit from more close cooperation with the National Park Service, which has been the federal land management agency leading the way in protecting visibility. Scientists from the public and private sectors are establishing a rapport that may eventually reduce the amount of contradictory analyses that are now commonplace.

Second, the EPA and state divisions of air quality often behave as adversaries in implementing clean air legislation. Resentment is fostered by the fact that federal regulations usually do not offer financial assistance to support expensive programs for compliance. Federal land management agencies are also at odds with or ignored by the EPA and states in the process of issuing permits to new stationary sources. How can significant deterioration in visibility be prevented if the agency responsible for protecting visibility is unable to influence the agency that is issuing a new permit? Another much needed endeavor is the creative cooperation of alternatives to litigation as a means of settling disputes. Until recently, the progress of compromise agreements has been impeded by a disproportionate distribution of political and

economic power. Now that some of these disparities have lessened, adversaries are able to sit down at the bargaining table with a comparable arsenal of weapons. These conditions create opportunities for reaching compromises outside the courtroom. Another promising way of reducing litigation is to encourage the continued use of negotiated rulemaking under the authority of the Federal Administrative Procedures Act.

Finally, regional cooperation is needed to address air quality issues. The Grand Canyon Visibility Transport Commission offers a unique opportunity for western states to lead the way in developing cooperative approaches to confront issues pertaining to regional haze. Further, states will have a chance to negotiate federal rules under which they all must abide, instead of having to react to rules imposed by the EPA.

The Prospect

Change is in the wind. Our panelists gave optimistic assessment of air quality issues. While expressing many concerns about the past, they nevertheless noted positive signs that bode well for the future of the Colorado Plateau.

Perhaps the most promising of these signs is a broadening acceptance of responsibility for improving air quality. States such as Colorado and California are starting to develop aggressive programs for reducing automobile emissions. Communities are adopting controls on wood-burning stoves. Operators of smelters and coal-fired generating stations are less inclined to resist all attempts to reduce their emissions.

The 1990 Clean Air Act did a remarkable thing. In effect, it said that polluters can no longer avoid the cost of cleaning up the air they pollute. As new rules are implemented, major sources of emissions will either have to adopt controls or pay an escalating price for the privilege to pollute. Such economic incentives will, of course, be passed on to consumers. As a result, we can anticipate another surge in the creation of alternative energy sources and changes in where and how we live. Conservation may be the most important growth industry since the Industrial Revolution.

The Colorado Plateau has borne a disproportionate share of environmental costs in the rush to supply cheap water and electricity to consumers. However, as we enter a new millennium, the prospects for cleaner air look good—we can envision a time of brighter edges on distant cliffs of the plateau's majestic canyonlands.